1994 Groundwater Survey for Alachlor in Southern Wisconsin

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BACKGROUND/NEED

Alachlor is used primarily to control grasses in corn and soybeans. It has been the second most frequently used herbicide in Wisconsin. Only atrazine has been used more. In 1990 alachlor was applied to 1,046,500 acres in Wisconsin, roughly half the acreage atrazine was applied to. Alachlor has a moderate potential to leach to groundwater. Wisconsin's groundwater enforcement standard for alachlor is 2.0 parts per billion (ppb). DATCP's monitoring well program shows that, of 30 monitoring sites at fields treated with alachlor, 10 showed some detection of alachlor. The National Alachlor Well Water Survey, conducted by Monsanto Company, found alachlor in less than 1% of wells sampled. Though DATCP officials believed that the presence of alachlor in groundwater is less widespread than atrazine, it was felt that a better assessment of the groundwater impacts of alachlor was needed.

A metabolite of alachlor, ethane sulfonic acid (ESA), is formed in soil and is subject to leaching. On the basis of the presence of ESA in monitoring wells downgradient of alachlor treated fields, DATCP and other state agencies decided that ESA should be included in the survey of alachlor in groundwater.

OBJECTIVES

The purpose of the survey was to determine the extent of alachlor or ESA contamination in Wisconsin private wells most at risk. The survey was designed to indicate whether a problem exists with alachlor or ESA in wells most at risk.

METHODS

Private wells were selected in areas of the state with the highest alachlor use. Selected wells also had either a previous detection of triazines between 0.1 and 3.0µg/l or nitrate over 10 ppm. Private wells in eleven counties (Columbia, Dane, dodge, Grant, Green, Jefferson, Iowa, Lafayette, Rock, Sauk, and Walworth) in the southern part of the state were investigated. Owners of the approximately 1300 selected wells were mailed an immunoassay test kit which detects the presence of alachlor and ESA and were instructed in proper sampling procedures. Those with a detection were offered a free followup analysis by gas chromatography (GC) and high pressure liquid chromatography (HPLC) analysis with sampling by DATCP personnel.

RESULTS/DISCUSSION

A total of 669 samples were returned for immunoassay analysis, 300 of which showed a detection. Of wells with a detection, 293 followup samples were collected and analyzed using GC-HPLC. Seven well owners refused resampling.

Alachlor was detected (Limit of detection = 0.15 µg/l) in only 12 of the 293 samples. ESA was detected in nine of these twelve samples. The minimum alachlor concentration detected was 0.21 µg/l, the maximum was 6.91 µg/l, and the average alachlor concentration for the 12 detections was 2.47 µg/l.

ESA was detected (Limit of detection = 1.0 μg/l) in 206 of the 293 samples. The minimum ESA concentration detected was 1.09 μg/l, the maximum was 26.7 μg/l, and the average ESA concentration for the 206 detections was 4.89 μg/l.

In approximately 30% of the followup samples the analysis did not confirm a detection of alachlor or ESA in the well. In almost all of these cases, the original immunoassay detection was very near the limit of detection of 1.0 μg/l.

CONCLUSIONS

Immunoassay analysis of the 669 screening samples showed a detection rate of 45%. While the selected private wells were thought to be at higher risk for alachlor contamination, the detection rate was higher than anticipated. Followup GC-HPLC analysis showed that 1.8% of the original 669 wells had detections of alachlor and that 32% had detections of ESA. The Immunoassay kit was selected for the survey because it was reactive to both the parent alachlor compound and its breakdown product, ESA. It appears to have been successful in detecting both compounds in private well samples.

DATCP will conduct site investigations around wells with alachlor concentrations at or above 2 ppb, which is the health-base enforcement standard. Wells with levels of ESA above 20 ppb, which is the interim health advisory for ESA, will also be investigated. These investigations will identify the source of groundwater contamination. If field use is identified as a source contributing to the contamination, site specific actions will be taken. This would include prohibition of the use of alachlor in areas encompassing areas upgradient and downgradient of the well.